

PROCESS FOR FORMING BACKED MICROPOROUS SHEET

FIELD OF USE, BACKGROUND AND PRIOR ART RELATIVE TO THE INVENTION

This invention relates to an improved process for making a microporous polyurethane body backed with fibrous sheet material.

In the U.S. Pat. of John J. McGarr, No. 3,551,364, dated Dec. 29, 1970, entitled "Processes for Making Microporous Polyurethane Bodies Employing Non-Boiling Liquid Alkyl Ethers or Liquid Aliphatic Hydrocarbons," there is disclosed a process in which an emulsion formed in which the discontinuous phase is droplets of a non-solvent liquid and the continuous phase is a reactive polymeric material convertible through reaction to a tough, solid, resilient film-forming condition. The emulsion is formed into a body of desired shape and reacted to solidify the reacted material with the droplets of non-solvent liquid held in the solidified body. The non-solvent liquid of the droplets is removed from the solidified body leaving spaces constituting openings or pores.

The patent also discloses procedure in which a layer of reactive emulsion is formed on a casting surface and a porous fibrous sheet is laid on the free surface of the layer while the layer is still in liquid condition before solidification through reaction. As noted in that patent, conditions adjacent the surface of the layer may cause the surface to be less porous than other portions of the layer.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a process for forming a microporous polyurethane body integrally united to a fibrous backing in which process improved uniform porosity is secured in the polyurethane material.

To this end and in accordance with a feature of the present invention liquid reactive urethane emulsion is cast as a layer on a casting surface with the surface opposite the casting surface stabilized until development of limited gel structure and thereafter a fibrous sheet is laid on the surface of the still pressure flowable emulsion and pressed into intimate engagement with the emulsion.

I have discovered a process for forming a microporous sheet with a fibrous backing in which overall uniform porosity of the microporous sheet is secured by casting a layer of an emulsion of which the liquid continuous phase is based on a polymeric material reactive to solid resilient condition and the dispersion phase is non-solvent liquid droplets and maintaining the layer of emulsion undisturbed with its surfaces covered during an initial period for development of a preliminary gel structure in which the layer has sufficient integrity to allow separation of a cover from the cast surface without distortion of the surface but the emulsion is flowable under pressure. At this point, a cover is removed from a surface of the layer and a fibrous sheet is pressed into intimate engagement with the layer. The reaction is continued to solidify the emulsion in firmly adherent relation to the fibrous sheet and the volatile liquid is removed from the solidified emulsion.

BRIEF DESCRIPTION OF THE DRAWING

Reference is made to the attached drawings forming part of the disclosure of the present case in which:

FIG. 1 is a diagrammatic elevational view of an arrangement of apparatus suitable for practicing the invention;

FIG. 2 is a fragmentary sectional elevational view taken on the line II—II of FIG. 1 of a cast layer with casting surfaces and cover sheet as may be formed on the apparatus of FIG. 1;

FIG. 3 is a fragmentary sectional elevational view of a cast layer with casting surface and fibrous backing layer taken on the line III—III of FIG. 1;

DESCRIPTION OF THE PREFERRED EMBODIMENT

Pores or passageways in a body of resilient polymeric material in the present process are secured by solidifying a reactive emulsion in which the dispersed phase is droplets of non-solvent liquid and the liquid continuous phase comprises reactive polymeric material, and removing the non-solvent liquid from the solidified continuous phase leaving the spaces previously occupied by the non-solvent liquid as pores and passageways. Reactive emulsions for use in the present process may be similar to the formulae used in the earlier filed patent of McGarr, referred to above.

Forming the combined microporous layer and fibrous backing according to the present invention involves providing a layer of the emulsion on a casting surface, directly disposing a cover sheet on the layer, maintaining the layer under conditions which do not disrupt the layer of emulsion during an initial period in which the emulsion thickens through reaction to develop a preliminary gel structure and through cooling of the emulsion and, at this point, removing the cover sheet and pressing a fibrous sheet into intimate engagement with the layer. Thereafter, the reaction to solidify the emulsion in firmly adherent relation to the fiber sheet is carried out and the volatile liquid is removed from the solidified emulsion leaving a uniform microporous layer integrally united with the fibrous sheet backing.

The process will be described in connection with an apparatus suitable for the manufacture of the backed microporous sheet; but it is to be understood that the procedures may be carried out by hand or with other suitable apparatus.

Referring to FIG. 1, polymeric reactants and non-solvent organic liquid to be mixed and emulsified are introduced through inlets 10 into the mixer-emulsifier 12 where they are acted on by the agitating blades 14. The resulting emulsion is discharged through nozzle 16 and deposited as a layer 18 on the casting surface 20.

In the form shown, the casting surface 20 is a release sheet supplied from a roll 22. The release sheet casting surface 20 is moved, suitably on conveyor 24 or on a slip plate (not shown) beneath the nozzle 16 which deposits the emulsion on successive portions of the surface. Where the deposited emulsion is to be cooled, suitable cooling means may be provided such as a chilled plate (not shown) beneath the sheet casting surface 20 carrying the layer 18 of emulsion.

A flexible cover sheet 26 from the roll 28 is laid down on the emulsion carried by the casting surface. Prefera-